C.R.O.P. -
Combined Regenerative Organic-food Production

Recycle plant waste in greenhouses with bio filtration

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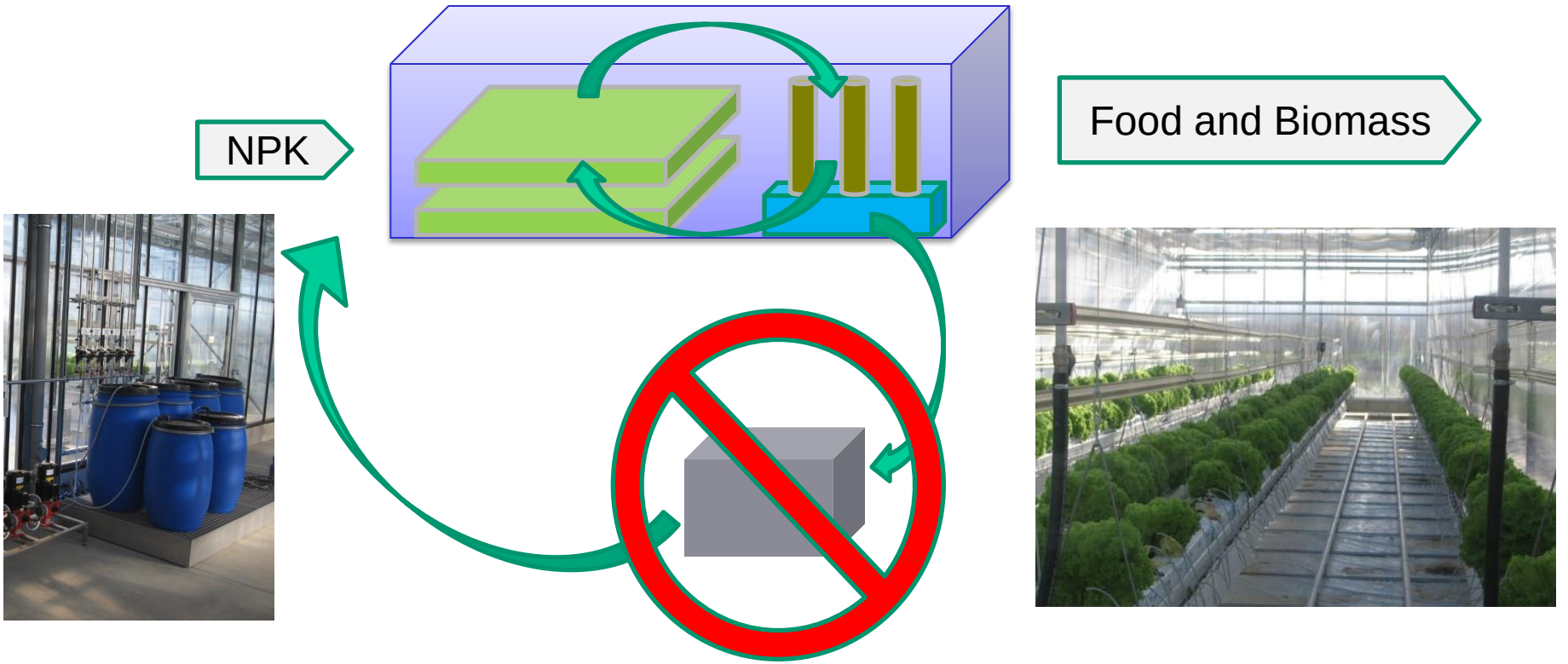
The aim of C.R.O.P.

universitätbonn landwirtschaftliche fakultät

Shorting of element cycles in closed systems



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The C.R.O.P.- Filter

- **Lava as Substrate**
- **Imitating Soil**
- **Aerobic and Anaerobic**

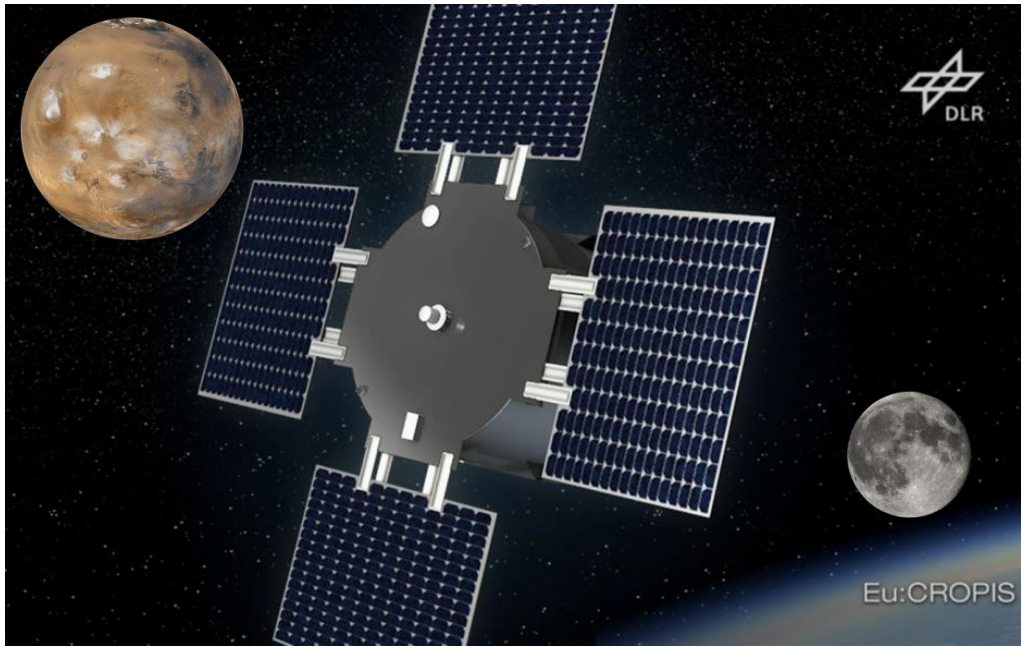
  Zones
- **Stability**

Popovici et al. 2011, Rom. Biotech. Letters; Blüm et al. 1995, Acta Astronaut.

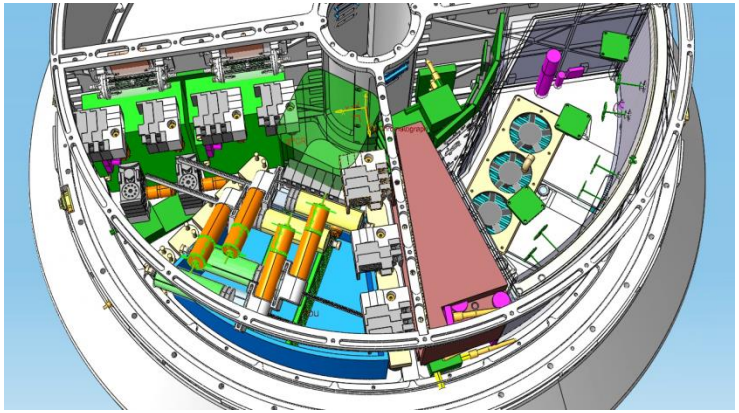
Eu:CROPIS

Euglena: Combined Regenerative Organic-Food Production in Space

Closed life support system under reduced gravity (Moon and Mars)



- Phase C/D
- Launch 2016
- Experiment time 2 x 6 months
- Moon and Mars gravity on board
- 2 DLR experiments, 3 from NASA Ames
- DLR Institutes for Space Systems and Aerospace Medicine



Long term experiment platform for life sciences

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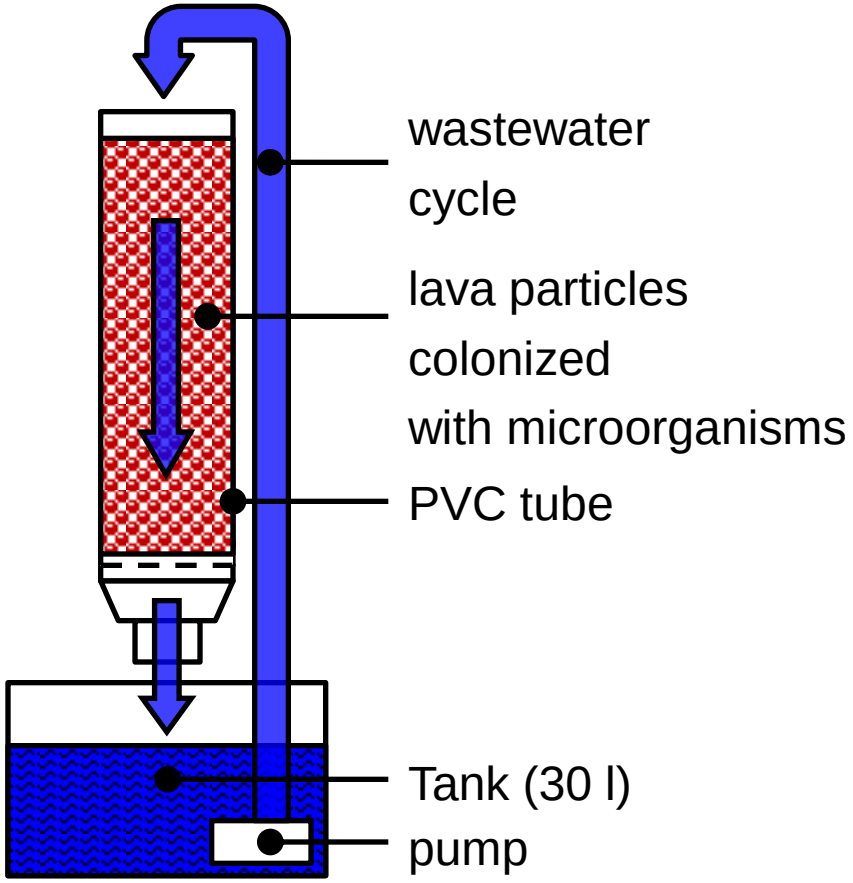
The filters of the DLR C.R.O.P. Testing Facility

Degradation of urine and biowaste



Some results with 7% of urine after 3 days .....

no filter

Colony forming units (aerob):

22° 1.00E+**09**/ml

36° 9.00E+**06**/ml

filter

Colony forming units (aerob):

22° 4.86E+**02**/ml

36° 3.28E+**02**/ml

In the greeenhouses of :agrohort …

Experiment in two steps:

1. Degradation biowaste with a CROP filter system in batch mode

2. Fertigation of cucumber plants. Control experiment with common fertilizer

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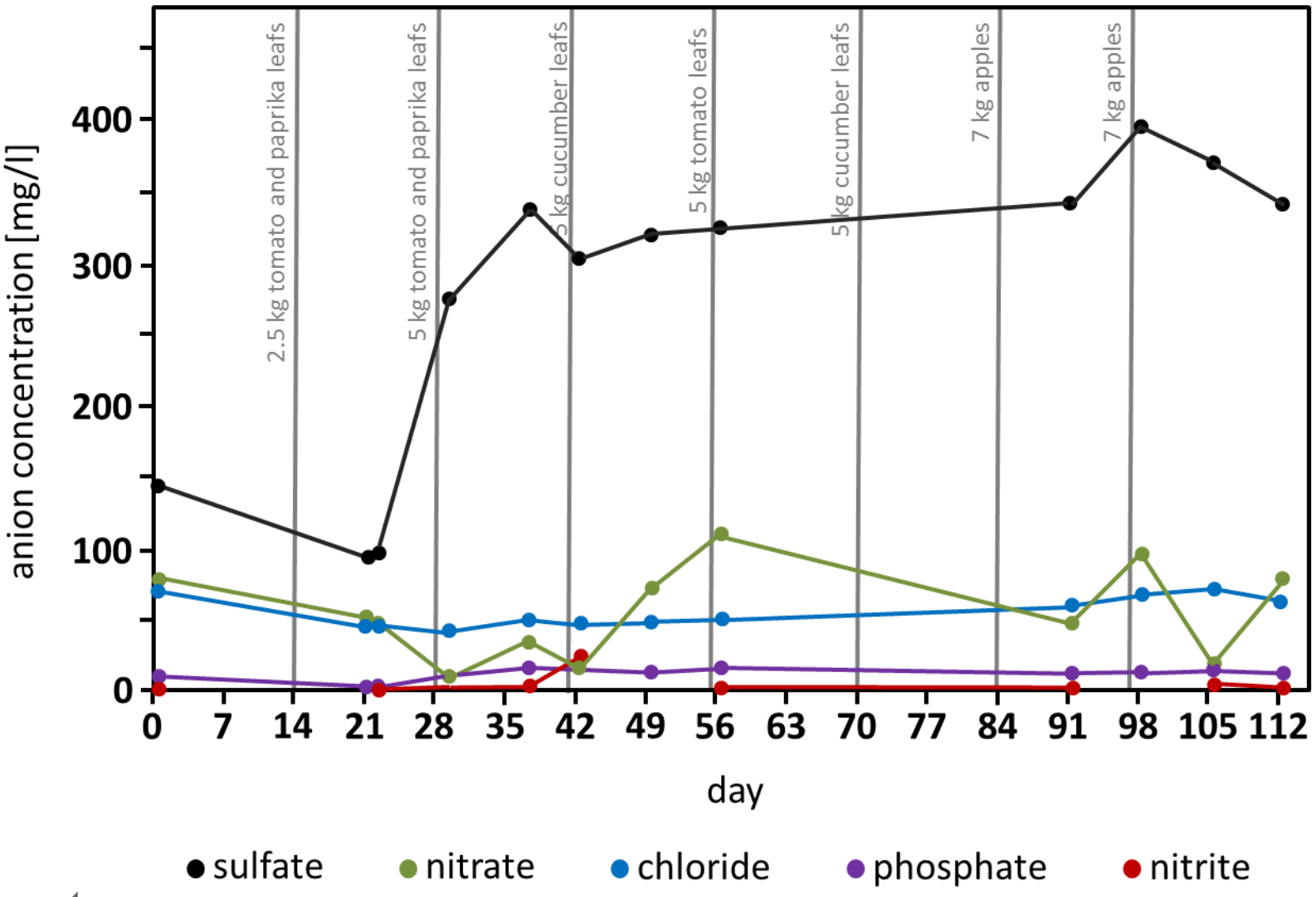
Results: Anions



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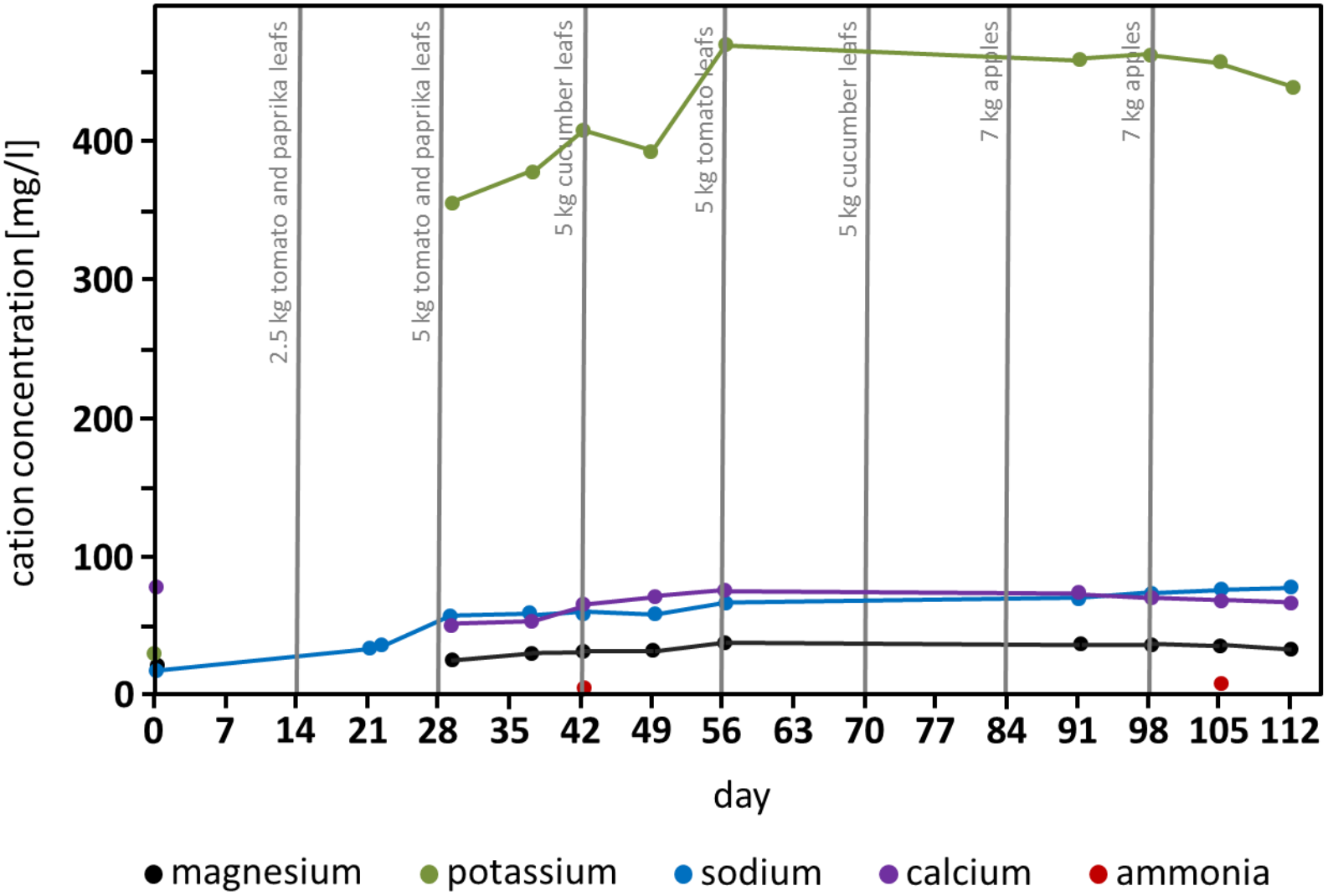
Results: Cations



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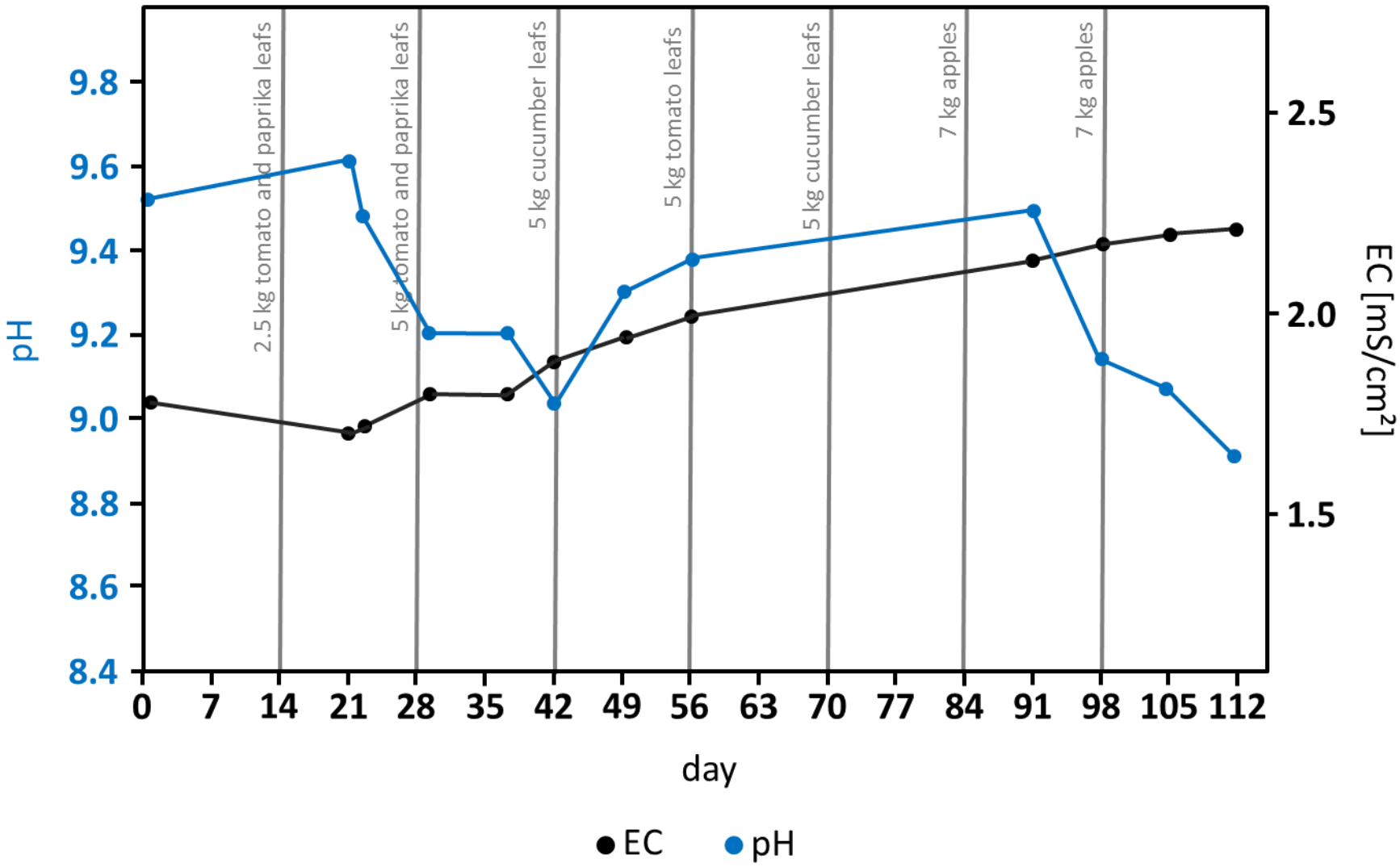
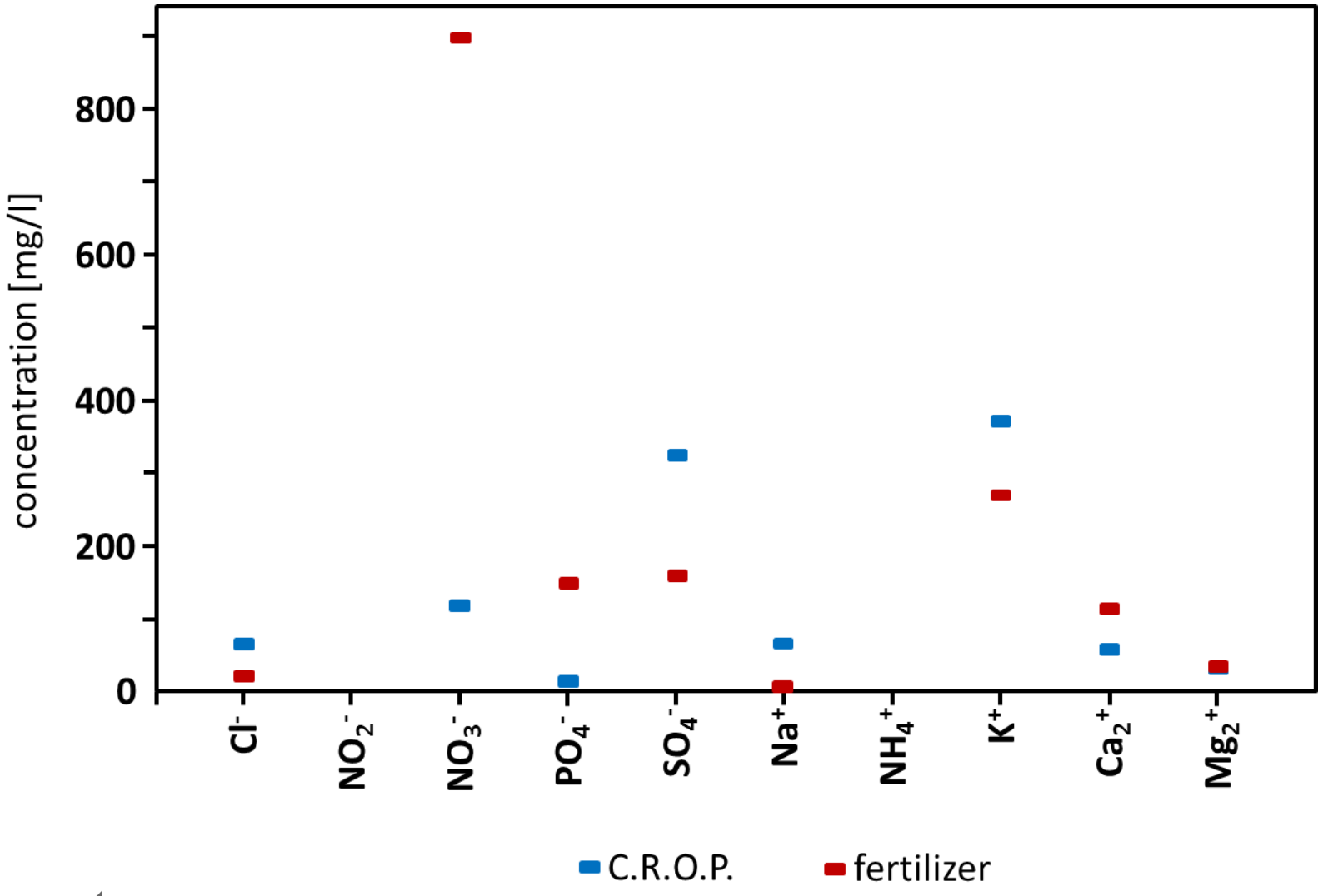
Results: pH and EC



GRODAN cucumber fertilizer vs. C.R.O.P. Solution



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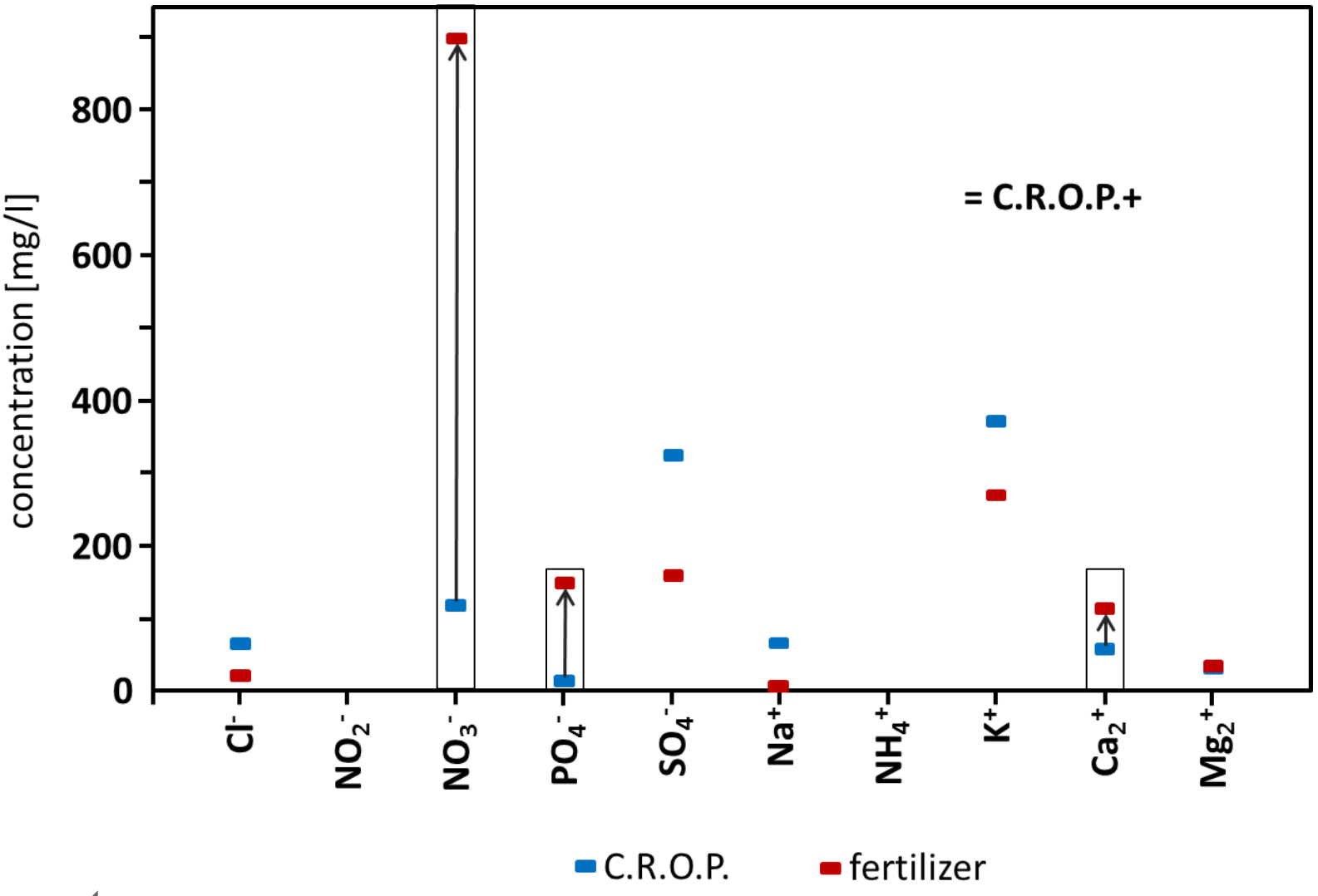
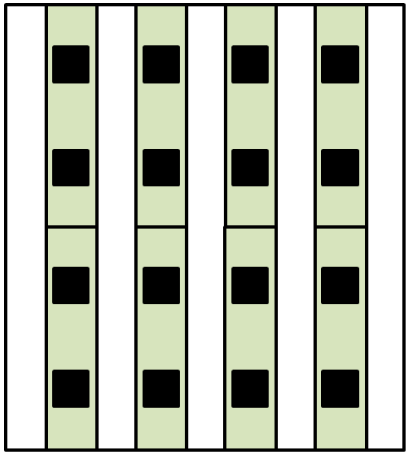
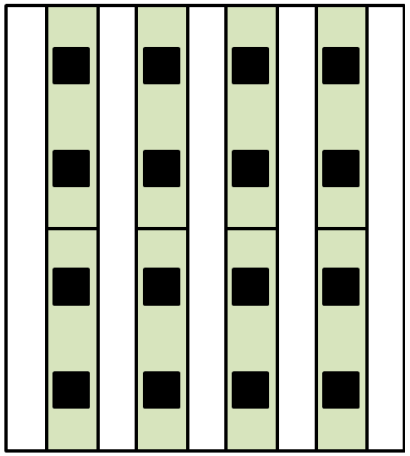
Tuning the C.R.O.P. Solution



Experiment setup with cucumber plants



C.R.O.P.+
n = 16



fertilizer
n = 16

- 2 hydroponic tables each with rock wool, 8 grow bags, 16 slabs per treatment
- n = 16
- 3-4 weeks old cucumber plants for each treatment

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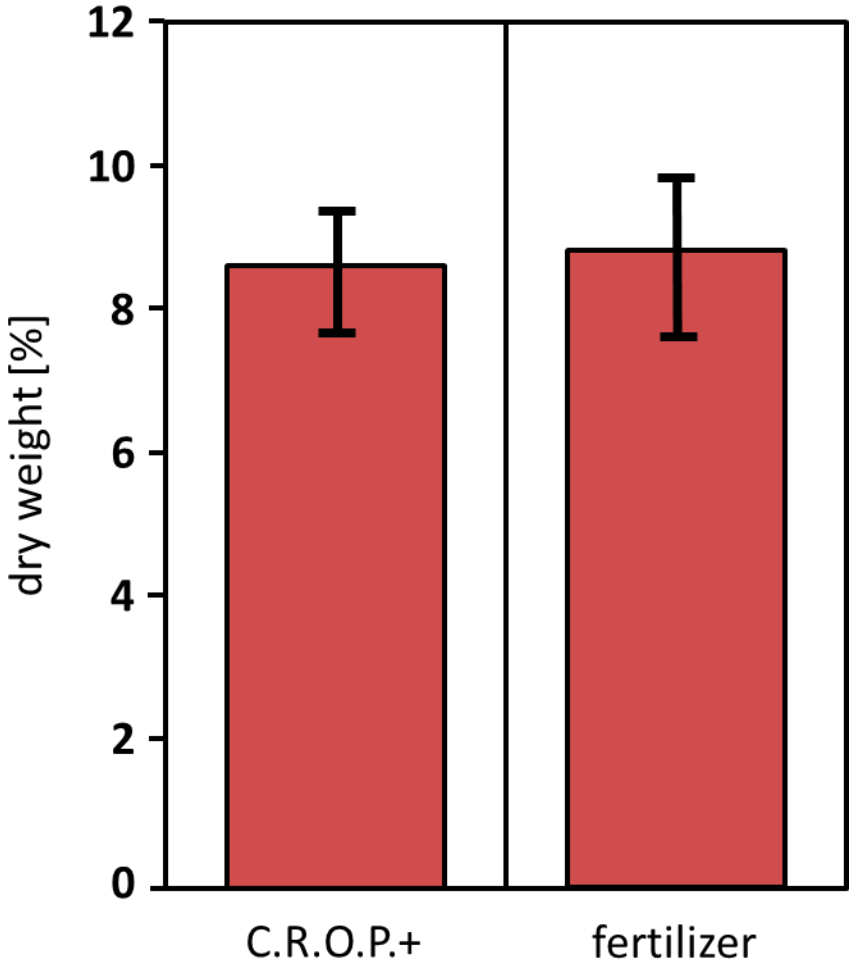
Results: Dry weight of cucumber plants

- No statistical difference in dry weight



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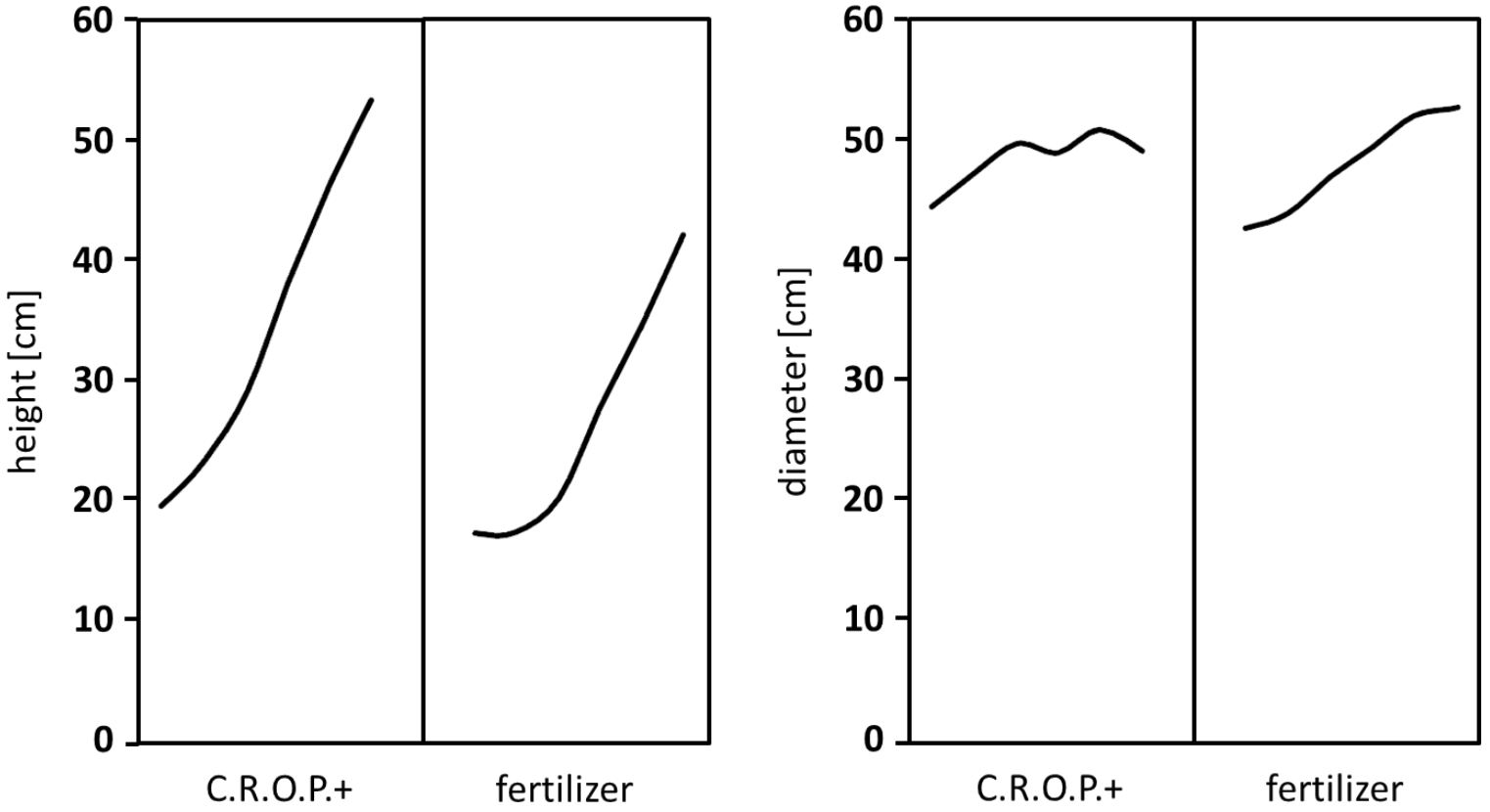
Results: Height and diameter of cucumber plants



Experiment: 3-4 weeks old cucumber plants in grow bags

CROP+ → fertigation with attuned CROP solution

fertilizer → fertigation with standard fertilizer

Take home

- Solution bio compatible
- Saving 10% of nitrate just with leafs
- Combining with nitrate and phosphor from urine sources

Tasks:

- High sulphate concentration
- Diet plan for fertilizer production
- Other plants
- Increasing the saving of fertilizer
- Further Experiments in the EDEN labs at DLR Bremen

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